Research Paper | Engineering | E-ISSN No : 2454-9916 | Volume : 5 | Issue : 6 | June 2019

# E-WAY APPROACH TO SENSE THE ROAD CONDITION USING MACHINE LEARNING

Sanjay K Jaiswal [1] | Umesh wagh [1] | Pratik Kamble [1] | Sanchit Kalra [1]

[1] Trinity College Of Engg and Research Pune, India.

## ABSTRACT

Monitoring road & traffic conditions in a city is a problem widely studied. Several methods have been proposed for addressing this problem. Several proposed techniques require dedicated hardware such as GPS-devices and acce-lerometers in vehicles or cameras on the road-side and near traffic signals. All such methods are expensive in terms of monetary cost and human effort required. We propose a notion- intrusive method that uses sensors present on smartphones. In the proposed system, we use an acce-lerometer, GPS sensor readings for traffic and road conditions detection. We are specifically interested in identifying braking events - frequent braking indicates congested traffic conditions - and bumps on the roads to characterize the type of road.

## I. INTRODUCTION:

To properly monitor, plan for maintenance and manage road infrastructure, a substantial amount of the data is always needed, particularly time series and up to date road condition data. Road condition data changes over time; since it also usually requires considerably significant investment and time to collect data on a regular basis, obtaining such data is often a challenge that many governments are facing, especially in countries where budget is limited and advance technology is still not affordable. Road surface roughness is regarded as one of the most important road conditions because it affects vehicle maintenance costs, fuel consumption, comfort, and safety. On the other hand, today's smartphones usually come with sensors that are capable of recording useful signal for road surface condition estimation similarly to those used in much high-tech equipment. There are some studies that are relevant to this work, such as the use standalone, mobile and smartphone sensors to assess and monitor road and traffic conditions detect road bumps/anomalies and their locations, and analyses events/features of different road defects; in simulation and real-life traffic conditions Further development includes the introduction of smartphone apps that claim to work in detecting road bumps and roughness condition. The final goal of this project is to develop a significantly simpler app that identifies road condition and inform another application user about traffic update.

## II. LITERATURE SURVEY:

1. **Paper Name:** A driving behavior detection system based on a smartphones built-in sensor

   **Author:** *Yantao Li, Fengtao Xue, Lei Feng and Zehui Qu*

   **Description:** Traffic accidents resulting from driving be-havior and road conditions are crucial problems for drivers. The causes and re-sponses to traffic accidents have been widely studied by researchers. Whereas several approaches have been proposed to ease these problems, most works entail high computational costs or rigid hardware conditions. More specifically, we first collect acceleration data from the acceleration sensor of a smartphone on a vehicle, and then utilize an acceleration reorientation calibration algorithm to convert the obtained acceleration data from the smartphone to acceleration data of the vehicle. Finally, we exploit Health Driving to detect driving events and road conditions, and evaluate the seriousness of the road conditions and driving events by using an efficient scoring mechanism based on the ISO 2631 standard. An ex-tensive evaluation demonstrates that Health Driving operates successfully with an ordinary smartphone, and operates with a low computational cost compared with other methods.

2. **Paper Name:** Road Condition Monitoring Using On-board Three-axis Accelerometer and GPS Sensor.

   **Author:** *Kongyang Chen, Mingming Lu, Xiaopeng Fan, Mingming Wei, and Jinwu Wu*

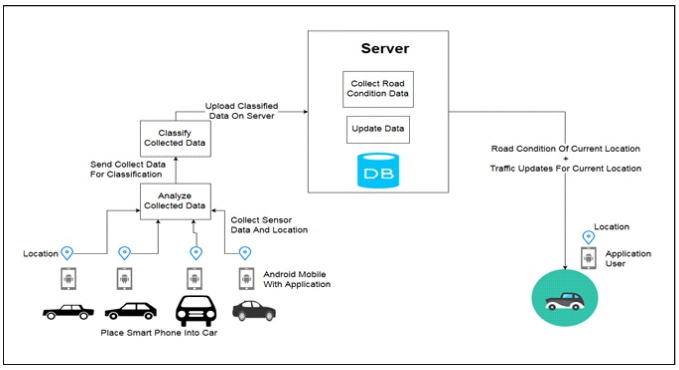
   **Description:** Authors present a low-cost vehicle-based solution, Road Condition Monitoring with Three-axis Accelerometers and GPS Sensors (RCM-TAGPS), by using a cheap three-axis accelerometer and a GPS sensor embedded in a vehicle to monitor the road condition.

3. **Paper Name:** An Efficient Algorithm For Pothole Detection Using Stereo Vision.

   **Author:** *Zhen Zhang, Xiao Ai, C. K. Chan and Naim Dahnoun*

   **Description:** A stereo vision based pothole de-tection system is proposed. Using the disparity map generated from an efficient disparity calculation algorithm, pot-holes can be detected by their distance from the fitted quadratic road surface. The system produces the size, volume and position of the potholes which allows the pothole repair to be prioritised according to its severity. The quad-ratic road surface model allows for camera or-ientation variation, road drainage and up/down hill gradients. Ex-perimental results show robust detection in various scenarios.

## III. SYSTEM ARCHITECTURE:




**Description:**

1. **User registration:** User information and vehicle information.

2. **Admin:** Admin module will be on the web module. Admin will verify user information and allow or reject to the user. If admin allows user then verification pin will send to user's registered mail id or mobile number. Admin can view all road conditions on the web. Admin can also add road condition on a particular location.

3. **User:** Cost User registers into the system with personal information. Automatically user verification request sends to admin. After verification user can log in into the system. After login user starts road condition detection service. If road conditions are present into the database then those road conditions are displayed to the user.

4. **System:** The system detects road condition with the help of mobile sensors. The system maintains records of road condition along with location into the database. System update record automatically by using the mobile sensor information.

**ALGORITHM:**

1. **C4.5 Decision Tree:**

   1. Check if algorithm satisfies termination criteria

   2. Computer information-theoretic criteria for all attributes

   3. Choose best attribute according to the information-theoretic criteria

   4. Create a decision node based on the best attribute in step 3

5. Induce (i.e. split) the dataset based on newly created decision node in step 4
6. For all sub-dataset in step 5, call C4.5 algorithm to get a sub-tree (recursive call)
7. Attach the tree obtained in step 6 to the decision node in step 4
8. Return tree

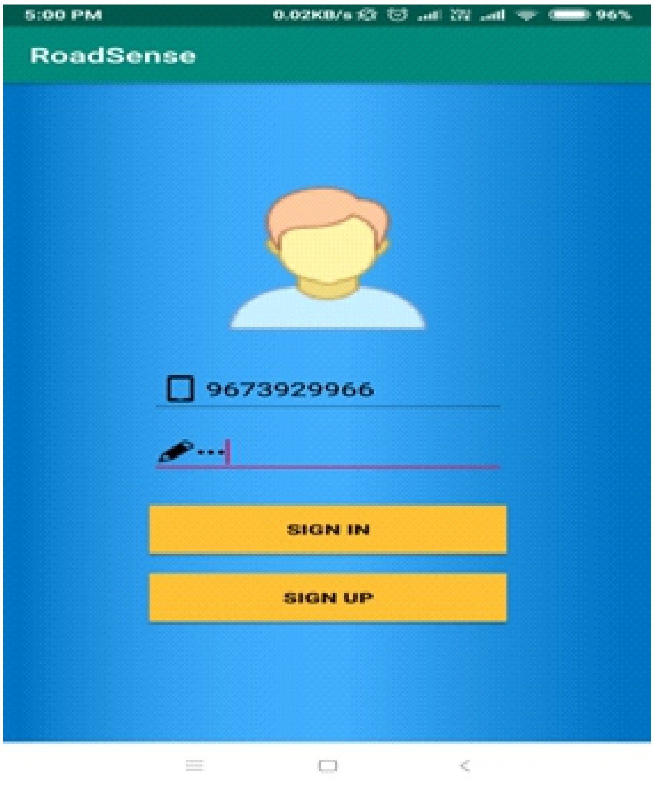
**2. Haversine algorithm to calculate the distance from target point to origin point:**

1. R is the radius of earth in meters.
2. LatO = latitude of origin point, LongO = longitude of origin point
3. LatT= latitude of target point, LongT= longitude of target point
4. Difference in latitude = LatO-LatT
5. Difference in longitude = LongO -LongT
6. Φ =Difference in latitude in radians
7. Λ =Difference in longitude in radians
8. O= LatO in radians.

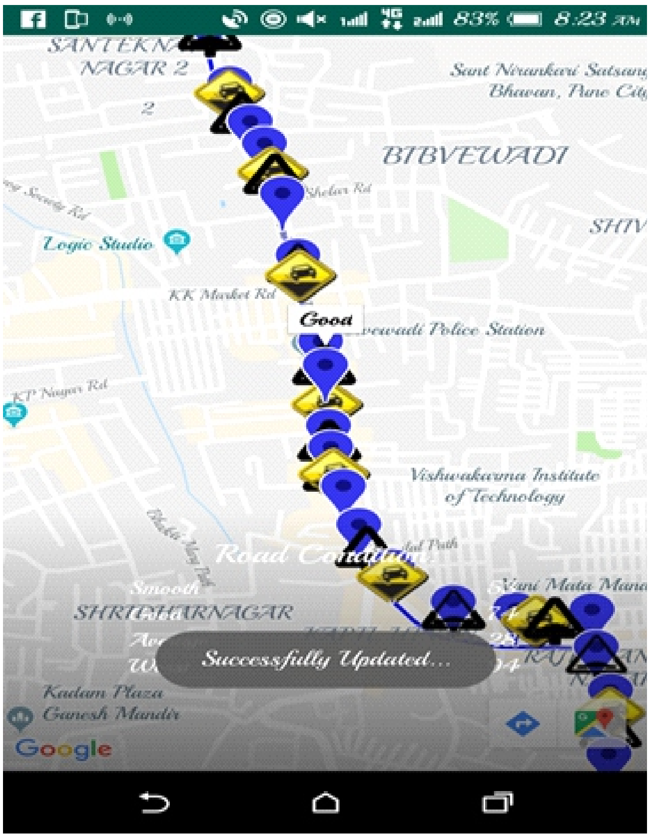
**IV. PROJECT SCOPE:**

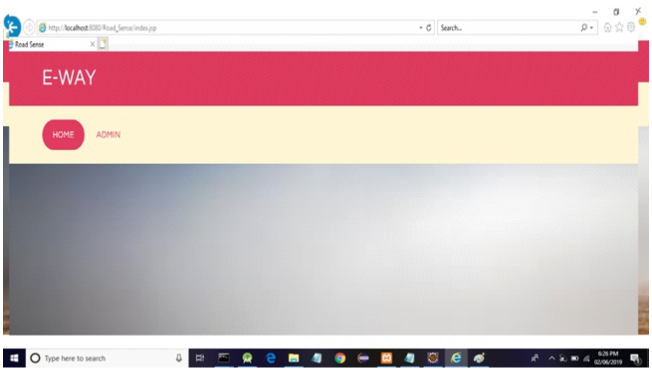
Propose system could be used in real time for identification of road surface condition. Propose system poses the ability to provide a smoother ride to the user. Road condition could be used to know the required time of journey.

**SCREEN SHOT**

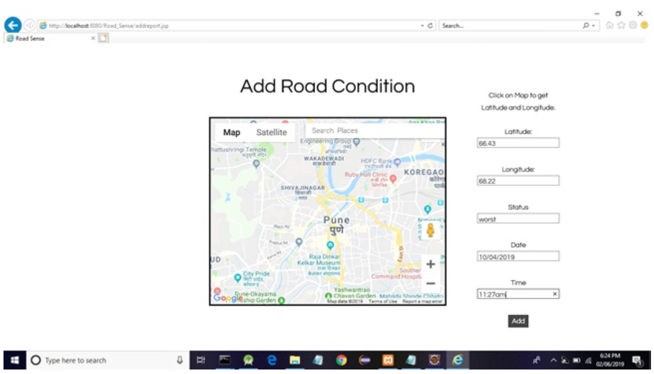



Login Page




Admin Login




Admin Map Part

## V. CONCLUSION:

Propose system uses an accelerometer and gyroscope sensor for collection of data and GPS for plotting the road location trace in Google map. We are going to implement the decision tree algorithm. Our best results are obtained thanks to a grouping of two sensors; accelerometer and gyroscope. We also going to inform the nearest user about traffic. The smartphone based method is very useful because it removes the need to deploy special sensors in the vehicle. It has the advantage of high scalability as smartphone users increases day by day. Thus, we have developed a smartphone application RoadSense. The RoadSense application is an attempt to provide its users with better knowledge about the routes of their transportation.

## VI. REFERENCES:


1. Yukie Ikeda ; Masahiro Inoue "An estimation of road surface conditions using participatory sensing". 2018 International Conference on Electronics, Information, and Communication (ICEIC)
2. Kazuyuki Kojima ; Hiroki Taniue ; Jun'ichi Kaneko "Mahalanobis distance-based road condition estimation method using network-connected manual wheelchair". 2016 IEEE International Conference on Consumer Electronics-Taiwan (ICCE-TW)
3. Takumi Satoh; Akihito Hiromori; Hirozumi Yamaguchi; Teruo Higashino "A novel estimation method of road condition for pedestrian navigation". 2015 IEEE International Conference on Pervasive Computing and Communication Workshops (PerCom Workshops)
4. Juan C. Tudón-Martínez; Soheib Fergani; Olivier Sename; John Jairo Martinez; Ruben Morales-Menendez; Luc Dugard, "Adaptive Road Profile Estimation in Semiactive Car Suspensions" IEEE Transactions on Control Systems Technology. Year: 2015, Volume: 23, Issue: 6

5 Viengnam Douangphachanh; Hiroyuki Oneyama "Estimation of road roughness condition from smartphones under realistic settings", 2013 13th International Conference on ITS Telecommunications (ITST)

6. Kongyang Chen; Mingming Lu; Xiaopeng Fan; Mingming Wei; Jinwu Wu "Road condition monitoring using on-board Three-axis Accelerometer and GPS Sensor", 2011 6th International ICST Conference on Communications and Networking in China (CHINACOM)